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On the Significance of Economic Structure and Regional Innovation Systems for the Foundation of Knowledge-Intensive Business Services

A Comparative Study in Bremen, Munich, and Stuttgart, Germany

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Abstract

The shift to new forms of knowledge creation reflects a remarkable increase in the number of knowledge-intensive business service firms (KIBS). KIBS are believed to be one of the main drivers of technological change and economic progress and can be described as "users, carriers and sources of innovation" (Miles et al. 1995). In addition to macroeconomic implications, newly founded KIBS are considered to play an important role within regional production and innovation systems. As firm founders in early stages of their firms' development mostly draw on regional resources and as KIBS acquire knowledge in the course of the interactive process that takes place when the service is provided, an intense interdependency between the regional economic, technological and institutional set-up and newly founded KIBS can be supposed. Within these processes of inter-relationship, "proximity" between the different actors of the particular innovation and production system clearly matters.

However, as entrepreneurship research has hardly ever investigated KIBS and research into the role of KIBS in processes of regional change has just begun, this contribution analyses the inter-relationships between KIBS foundations and actors within the respective innovation and production system. In a qualitative and conceptual way, in-depth studies of three German metropolitan regions with regard to the foundation of KIBS will be outlined. The results indicate that the necessity to adapt regional structures goes hand in hand with an exploitation of regional knowledge and the creation of "bridging institutions" in the shape of KIBS foundations.

1 Background, research questions, and objectives

Since the early 1990s knowledge-intensive business service firms (KIBS) have been examined within the political as well as the scientific debate (Almus et al. 2001; Engel/Steil 1999; Hipp 2000; Meyer-Krahmer/Lay 2001; Licht/Nerlinger 1997; Motzkus 2000; Muller 2001; Strambach 1995, 1999; Wimmers et al. 1999). They are believed to be one of the main drivers of technological change and economic progress. In particular, by taking advantage of information and communication technologies, KIBS increasingly play the role of "converters" of technological information within the economy (Czarnitzky/ Spielkamp 2000). They are providers, purchasers, or partners in the context of innovation. The dynamic growth of KIBS is an indicator for the increased need for transdisciplinary application and problem-oriented knowledge in innovation systems.

KIBS mostly provide non-material, intangible services. Specialised expert knowledge, research and development competencies, and problem-solving are the real products of KIBS. The provision of these knowledge-intensive services requires in-depth interac-

tion between supplier and client. Both parties are involved in cumulative learning processes (Strambach 2002). KIBS are more innovative than ordinary services, they perform R&D (continuously or dis-continuously). and they are thus rather on the technology-push side, they engage in innovation co-operations, and, last but not least, their employees are mostly highly skilled.

A remarkable increase in the number of firms and employees as well as an increase of firm foundation rates can be noted in the sector since the 1990s. In addition to the macroeconomic implications, newly founded KIBS are believed to play an important role in regional production and innovation systems. Due to their functions as "users, carriers and sources of innovation" (Miles et al. 1995), they are capable of fostering regional endogenous (technological) potentials and contributing to the growth of employment, income, and productivity. Newly founded KIBS (as well as technology-oriented start-ups in general) facilitate incremental and radical innovations and are – under certain circumstances – able to initiate or support paradigmatic technological change.

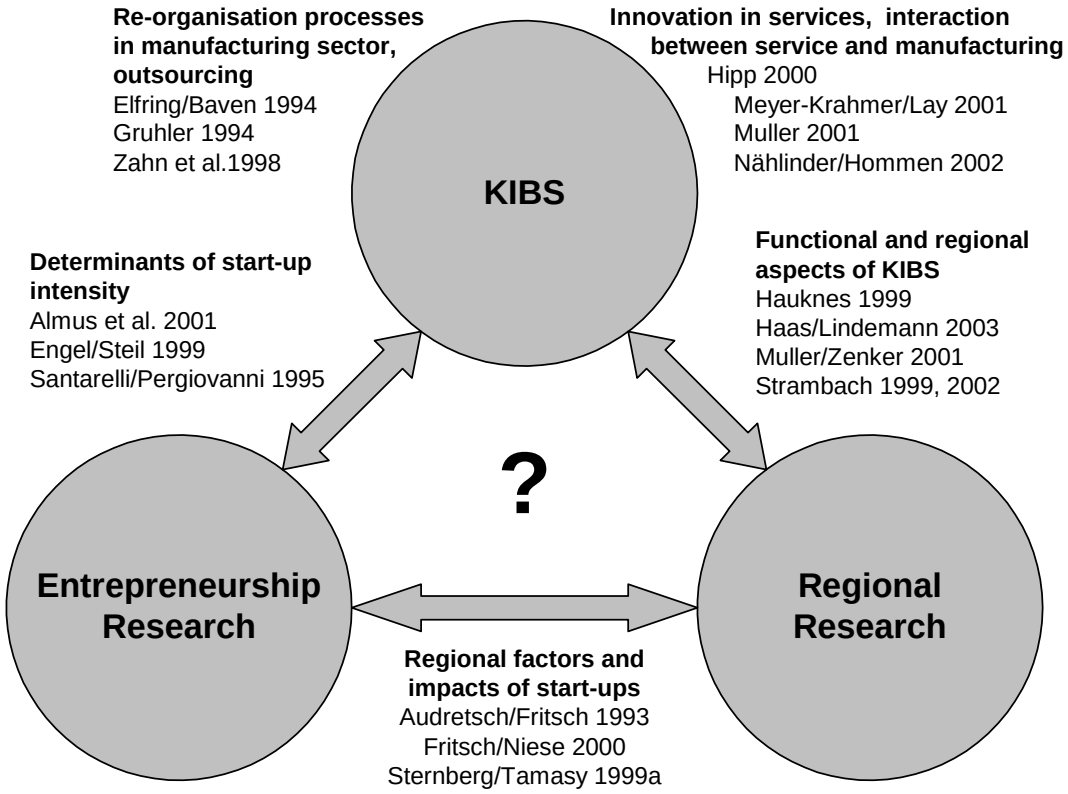
In contrast to the interdisciplinary character of entrepreneurship research, studies dealing with KIBS originate predominantly in business administration or economics. These studies focus for example on:

- Innovation activities in the service sector in general (Hauknes 1996; Licht/Nerlinger 1997; Miles et al. 1995).
- The role of KIBS within the scope of outsourcing activities of manufacturing firms (Elfring/Baven 1994; Gruhler 1994; Koschatzky et al. 2003; Zahn et al. 1998, Zahn/Soehnle 1998).
- The inter-relationships and modes of co-operation between small and medium-sized enterprises and KIBS in innovation processes (Czarnitzki/Spielkamp 2000; Meyer-Krahmer/Lay 2001; Muller 2001; Reindl 2002).
- The importance of KIBS under aspects of regional economic development and change (den Hertog/Bilderbeek 1998, Muller/Zenker 2001, Strambach 1995, 1999).

However, entrepreneurship research has hardly ever investigated KIBS. Indeed Almus et al. (2001), Engel/Steil (1999), and Santarelli/Piergiovanni (1995) have done quantitative studies on KIBS foundations by carrying out econometric analyses examining determinants of divergent regional start-up rates. Unlike these studies, results and statements based on qualitative firm-level investigations have rather been the exception. Recently, the role of inter-organisational relationships of newly founded firms has been investigated by economic geographers and regional researchers (e.g. Sternberg/Tamasy 1999a). Bathelt/ Glückler (2002) point out that most of the studies – as they are quantitative in nature - do not consider the influences of regional social and economic processes on start-up activities.

The contribution of newly founded KIBS to regional modernisation and renewal processes, their access to regional innovation and production networks, and the emergence and development of their inter-relationships to manufacturing enterprises in the course of their foundation remain to be analysed. In generating and analysing large statistical datasets, important factors with regard to start-up, survival, and growth processes have been identified. But determinants on the "micro-level", in particular the inter-relationship between entrepreneurial, company, and external (regional) factors have been neglected (Figure 1).

Figure 1: KIBS, entrepreneurship research, and regional research: Research fields and literature examples



This contribution is designed to close some of these gaps in existing research. Almus et al. (2001) argue that the foundation rate in the KIBS sector is partially dependent on the existing (regional) economic structure. However, the technological structure/specialisation and institutional set-up also influence the foundation pattern. And, furthermore, the KIBS sector itself is affected by the increasing innovativeness of its firms and the subsequently changing technological and institutional structures and dynamics. This paper focuses on these interdependencies by analysing the innovation systems (technologies, institutions) in three German regions with regard to the foundation of KIBS. The contribution is based on the authors' qualitative studies (interview

guided approach and document analysis) in the German metropolitan regions of Bremen, Munich, and Stuttgart which will be presented in form of regional case studies.

The paper is structured as follows: in the next section (2) some theoretical considerations with regard to the inter-relationships of regional innovation systems with their specific configurations of actors and institutions and newly founded KIBS will be outlined. Along the way, three hypotheses concerning the interface between KIBS, entrepreneurship and regions will be set up. In the subsequent chapters these hypotheses will serve as a guideline for exploring the results of our qualitative regional case studies. An insight into the KIBS sector as well as a cross-regional overview presenting some economic and KIBS start-up indicators in the regions of analysis will be the subject of chapter 3. The fourth section highlights the case studies of Bremen, Munich, and Stuttgart. A synthesis of the major empirical findings outlines the most important similarities and differences of the analysed regions with regard to our hypotheses (4.5). A closing section (5) gives some indications for further research.

2 Theoretical considerations – the foundation of KIBS in a regional context

No accepted theoretical concept exists to explain entrepreneurship activities and start-up probabilities - whether on a national or on a regional level. Several alternative theoretical approaches and concepts try to explain start-up frequencies as a result of individual decisions. For quite a while the reasons for different start-up probabilities were primarily seen on the supply side and in the personality of the entrepreneur. Within this context the focus of the researchers was directed to the motivations and motives for a firm foundation. More recently, the demand side or "external" factors for firms and entrepreneurs gained importance. Compared to entrepreneur-associated and firm-associated factors influencing the development of start-ups, environmental factors linked to the specific regional environment have been less investigated in entrepreneurship research (for an overview of relevant literature, see Sternberg 2000). Particularly various current concepts in regional research (e.g. innovation networks, regional innovation systems, governance approach, etc.) may be used – although not explicitly developed to explain regional entrepreneurial activities – to analyse specific aspects of firm foundation processes. Those aspects may deal for example with:

- the access of newly founded firms to innovation and production networks,
- the institutional regulation of entrepreneurial activities,
- the inter-relationships between economic preconditions and start-up patterns and
- the contribution of new firms to regional structural change (e.g. path dependency of certain types of start-ups).

These approaches explicitly consider the individual decisions of (potential) entrepreneurs that are immediately connected to the regional environment (Backes-Gellner et al. 2002). For example, growth-oriented start-up firms with their respective locations are much more dependent on local/regional preconditions than mature big firms. Within this particular context, Scheidt (1995) argues that a start-up company is not able to influence its regional environment by creating an innovation- and production system that fits the specific needs of that particular company. In contrast to established companies, newly founded firms rather adapt to the regional environment in order to survive and to be successful. From the new firms' network point of view, entrepreneur-associated factors like business attitude and behaviour seem to depend on the network partners rather than the opposite. In this sense, routinised entrepreneurial regimes can be characterised as favouring innovation and business activities which are close to the regional techno-economic and institutional path and are essentially incremental.

The probability of a person setting up a company in a certain region is higher, ceteris paribus, if more and bigger incubator organisations with sufficient fertility (i.e. as origin of start-ups) exist in that particular region (Bathelt/Glückler 2002). Furthermore, already existing start-up companies also profit in their development from the fertility of the region. In addition to incubator organisations, intermediate institutions (e.g. technology transfer organisations, financing institutions, consultants, patent attorneys etc.) and an appropriate entrepreneurial climate appear to be of crucial importance. Within a self-enforcing process, for example through role models of successful entrepreneurs and their intra-regional integration, regional start-up clusters may emerge. In these clusters, young companies have a better economic performance because of agglomeration advantages and other positive external effects based on proximity. As a result of the potential entrepreneurs' knowledge of those advantages, the start-up frequency increases – a self-enforcing cumulative process caused by regional factors is under way. Richert/Schiller 1994 and Sternberg et al. 1997 put it: The entrepreneur will select the firms' location because of information advantages and risk-reducing aspects within the region he knows best (e.g. former workplace, residence).

In addition, the regions' pre-requisites strongly influence the early development of the company (Reynolds et al. 1994). Regional determinants correspond essentially with the structure and allocation of population influenced by the set-up of "soft factors", the number of other innovative firms, the economic prosperity, and the technological intensity of the regional economy. The analysis of regional factors seems to give evidence to the advantages of spatial immobility and professional (as well as private) integration of an entrepreneur into the firms' location. Especially the assessment of the motives concerning the firms' location decision illustrates the importance of the regional environment. Young innovative companies are, for example, more successful the bigger the importance of existing relationships with universities and the supply of qualified employees for the selection of the firms' location was (Sternberg/Tamasy

1999a). In this particular context, Sternberg (2000) points to the importance of proximity within the founding process and identifies egocentric networks as key elements of a regional "entrepreneurial social infrastructure".

With regard to the founding and early development process of KIBS, the analytical approach of the entrepreneurs‘ egocentric networks has to be supplemented. The specific importance of knowledge is a special characteristic of KIBS in this regard. It is assumed that knowledge and its organisation is tied to personal capabilities and information (know-how, know-who) and therefore has a geographical component (Foray/Lundvall 1996; Koschatzky 2001). "Tacit knowledge" in terms of e.g. business behaviour, routines and attitudes is only available at certain locations where the connected learning processes can be realized. Storper (1995) designated these forms of knowledge as "untraded interdependencies". According to the quality of knowledge and the mixture of codified and implicit ("embodied") knowledge, geographical "knowledge islands" (defined for example through labour markets) may have different degrees of attractiveness for external companies. They influence the production and innovation activities of the existing companies as well as the willingness of the population to become entrepreneurs (Koschatzky 2001). Subsequently, we can map out a first hypothesis:

H 1: The foundation pattern of KIBS (quantity, quality, dynamic, success etc.) strongly depends on the regions’ specific techno-economic and institutional structure. Especially regional knowledge sources external to firms and entrepreneurs are crucial for the foundation of KIBS. In this sense, some regions can be seedbeds or incubators for new KIBS.

Apart from the influence of the knowledge infrastructure, the seedbed function of certain regions for start-up firms can also be attributed to the size of the regional market. The regional availability of clients can be fundamental for the market entrance, the survival and success of a newly founded company. However, Oakey (1984) emphasises that for young, innovative firms in the manufacturing sector the sales of products in the region is secondary. Questionable is whether KIBS behave in the same manner. Although the services offered can be characterised likewise as being innovative and highly specialised, and therefore a regional market concentration is the exception rather than the rule, it is assumed here that the distance to the lead client in the early development phase of the firm is growth (success) determining (Scheidt 1995). Similarly, Schamp (2000) points out that primarily small single firm companies with limited sales distances and production technologies that do not achieve scale effects rely on the proximity to clients: this applies to arguments of immobility because of social ties, sunk costs as well as risk-minimizing aspects.

However, regarding the heterogeneity of the KIBS sector, various differences concerning the importance of proximity or the necessity of a geographical co-location to potential knowledge-providers can be assumed. Although it is argued here that – particu-

larly for newly-founded KIBS – the integration into regional co-operation and value-chain structures[1] or the access to innovation and production networks plays a key role, the importance of proximity in the founding and early development process has to be proved separately for each company. The heterogeneity of the KIBS sector is reflected also in the foundation patterns in different regions. Czarnitzky/Spielkamp (2000) remark that, while classical *technical services* like engineering consultants are closely interwoven with the manufacturing sector (manufacturing firms are their most important clients and source of information concerning innovations), *software and information services* and *consultancies* show broader patterns regarding these inter-linkages. *Professional business services* like business consultants or advertisers are more closely related to their suppliers. Accordingly, we may deduce a second hypothesis:

H 2: Differences in the significance of spatial proximity between clients from different branches and KIBS affect the sectoral distribution of newly founded KIBS within a specific regional innovation system. This implies diverse horizontal and vertical inter-connections between KIBS and existing companies on different spatial levels.

For obvious reasons, the sectoral distribution of newly founded KIBS and the intensity of embeddedness into a regional innovation system may affect the modernisation and renewal processes of the whole system. Hauknes (1998) points out the strong connections between a regional innovation system and the local business service firms. The systemic innovation approach supports the network oriented feature of service innovations. Also Illeris (1991) emphasizes the close connection between the economic development of a region and the quality of the embedded networks. As companies (mature as well as new ones) are normally interlinked on various regional scales, those networks are not limited to the region. For the region of Baden in Germany for example, Koschatzky/Traxel (1997) have shown that standardized business services like tax advising, attorneys and vocational training are predominantly regionally demanded, while services with a strategic function (professional consulting, R&D services etc.) are also demanded from clients located outside the region. Generally spoken, the

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1 The underlying hypothesis for this fact claims that firm co-operations with external actors are a pre-condition and a result of an increase in the division of labour or vertical disintegration (Herden 1992; Heydebreck 1996; Storper 1996). In an economy based on the division of labour, technology acquisition, innovation, production, and the sale of a product are no longer realised by a single company. Instead, co-operation and mutual interaction of different actors takes place (Koschatzky 2001). For this kind of co-operation the term “company network“ is generally accepted. Company networks are a specific form of interaction with external partners. They integrate actors, resources, and activities and can be considered as systems (Casti 1995). Powell (1990) and Bradach/Eccles (1991) understand company networks as a mixture of market and hierarchy elements that are organisationally tied together in various manners. Taking into account the specific characteristics of KIBS, particularly their knowledge orientation and the fact that services cannot be stored and traded, it is assumed here that proximity between KIBS and clients (also as knowledge-providers) is a pre-condition for the firm‘s success.

"proximity effect" depends on the sectoral distribution of KIBS firms, on the size and organisational structure of the client as well as on the spatial concentration of the national market (Moulaert et al. 2001).

In assuming and optimising logistic, marketing, controlling, and management tasks for other companies, KIBS can be defined as "knowledge bridges". Heidenreich (1997) points out that the creation of "bridging institutions" in the form of KIBS is crucial for the renewal of innovation networks. Arguing likewise, for den Hertog/Bilderbeek (1998) KIBS turn out to be a "second" knowledge infrastructure and complete or take over the intermediary role traditionally played by the institutionalised public ("first") knowledge infrastructure. Nevertheless, most of the KIBS seem to be insufficiently integrated into national (or international) innovation systems. Particularly the connection between KIBS and public knowledge-providers of regional, national or international innovation systems seems to be underdeveloped (Hauknes 1998). Accordingly, we may formulate a last hypothesis:

H 3: The impact of newly founded KIBS on regional development depends on the degree of embeddedness or the requirement of proximity and the sectoral distribution. Technical services with close connections to the manufacturing sector may contribute to a mixed service-manufacturing cluster, while weakly embedded KIBS (e.g. software and information services, consultancies) may rather serve as a nucleus for a sectoral service cluster and/or connect the region with external knowledge resources.

In the following, the presented hypotheses will be examined in an explorative way. It is not our aim in this paper to statistically test hypotheses. Our qualitative analysis will allow for in-depth insights into the interface between newly founded KIBS and regional innovation systems.

3 The surveyed sectors and regions – an overview

3.1 What are "Knowledge-Intensive Business Services"?

There is an ample discussion in scientific literature about how to classify the branches and firms belonging to the KIBS sector (e.g. Bayerisches Staatsministerium für Wirtschaft, Verkehr und Technologie 2000, Miles et al. 1995). The main problem thereby is the compatibility of the official systematic of industries and services with the "real world" (Bilderbeek/den Hertog 1998). As the service sector, and in particular the KIBS sector, is a highly dynamic field of economic action, the definitions of the boun-

daries for the respective sub-sectors change frequently and rapidly.[2] It is therefore important to clarify the characteristics of KIBS first and then to discuss how KIBS can be identified within the existing systematic classification of economic sectors.

Regarding the characteristics of KIBS, the meanings of knowledge intensity as well as business orientation have to be defined. It is difficult to establish "hard" indicators about "knowledge intensity". In general, the formal qualification structure of employees is used to define "knowledge intensity" (Haas/Lindemann 2003, OECD 2001). This indicator is relatively easy to survey, although it has the disadvantage that professional experiences of the employees in the KIBS – which are often crucial for the competencies of the whole enterprise – are being lost. Furthermore, while this indicator may well serve to survey the know-how input of the firms, it is not indicative for their outputs – for example their innovativeness of products and services (Haas/Lindemann 2003). In order to assess the output statistically, it would be necessary to collect e.g. data about patenting activities, investments in R&D, and the like. However, it must be stated that *"the definition of knowledge-intensive sectors is a relative affair"* (Miles et al. 1995, p. 17). Regarding the business orientation of the firms, it is common to classify those branches or firms as business-oriented which provide their services predominantly for other firms – and not for private households or individuals (Almus et al. 2001).

In order to generate comparable results and to operationalise the hypotheses, it is necessary to draw on existing classifications of the KIBS sector using the ISIC (International Standard Industry Classification) systematic classification. However, the qualitative approach used in this paper will allow us to go beyond this classification by surveying also the borders of the sectors.

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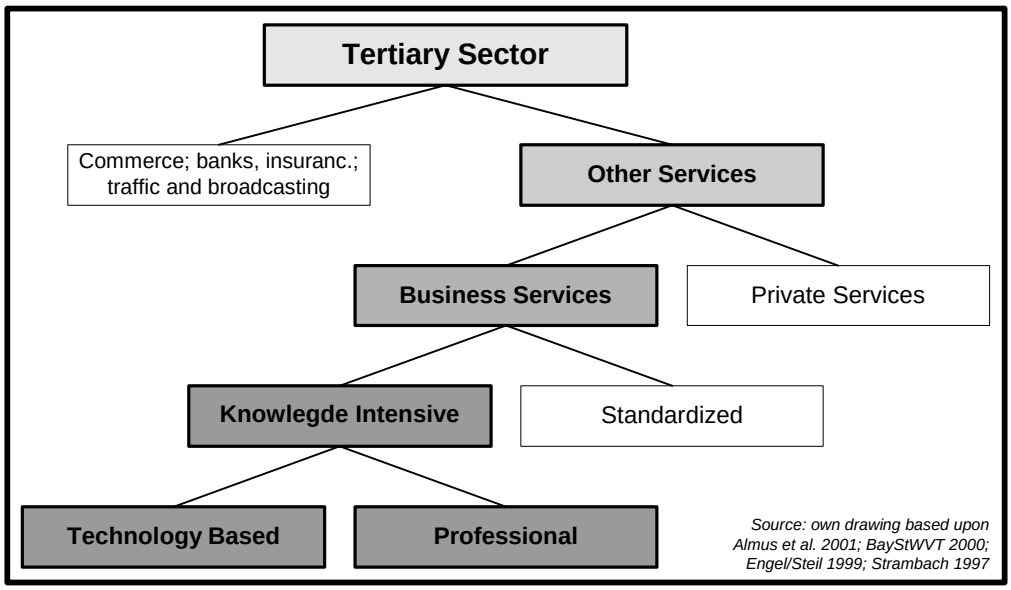
2 This is especially evident in constantly shortening product life cycles and in the high fluctuation of firms (entries and exits).

Figure 2: Knowledge-Intensive Business Services as a part of the tertiary sector



According to the ISIC, excluding the commercial, financial, insurance, and radio/television sector, the remaining "Other Services" are normally subdivided into business services and services directed to private households (e.g. social services). Within the business services sector, knowledge-intensive and standardized services (such as industrial cleaning) can be distinguished (Figure 2). For our empirical investigation, we followed the "mainstream" of the reviewed publications (see Figure 3) and include in our survey the so-called *Technical KIBS* (T-KIBS) from the sectors 72, 73.1, 74.2 and 74.3 as well as the *Traditional Professional KIBS* (P-KIBS)[3] from the sectors 73.2, 74.1 and 74.4.[4]

3 This differentiation is derived from Nählinder/Hommen (2002).

4 Some authors do not include the *Computer and Related Activities* (72) in the T-KIBS and instead establish a third category for these (see, for example Czarnitzky/Spielkamp 2000). A different typology is suggested by Miles et al. (1995), who distinguish between KIBS that are *users* of new technology and those that are *producers* of new technology. However, the authors do not even try to operationalise this systematic approach and this might be quite difficult. Nevertheless, it is important to note that KIBS could be users and/or producers of new technologies/innovations.

Figure 3: Knowledge-Intensive Business Services according to different authors

NACE-Code	3-digit sector (name)	1	2	3	4	5	6	7
22.1	Publishing							
64.2	Telecommunications							
72.1	Hardware consultancy							
72.2	Software consultancy and supply							
72.3	Data processing							
72.4	Data base activities							
72.5	Mainten. and repair of office, accounting and comput. machin.							
72.6	Other computer related activities							
73	Research and development							
74.1	Legal, accounting, book-keeping and auditing activities etc.							
74.2	Architect. and engin. activities and related techn. consultancy							
74.3	Technical testing and analysis							
74.4	Advertising							
74.5	Labour recruitment and provision of personnel							
74.8	Miscellaneous business activities n.e.c.							
92.2	Radio and television activities							
92.4	News agency activities							

Sources: (1) Almus et al. 2001, (2) BayStWVT 2000, (3) Bilderbeek/den Hertog 1998, (4) Engel/Steil 1999, (5) Nählinder/Hommen 2002, (6) Strambach 1999, (7) ZEW 2003

3.2 The examined regions

The hypotheses were examined in three West German agglomeration regions using the regional level of planning regions.[5] For several reasons we chose the regions of Bremen, Munich and Stuttgart: all three cities are federal state capitals. They therefore possess a comparable political structure and the public sector has a certain importance. Regarding economic structure, dynamics of economic development, and institutional setting they differ significantly; this makes it possible to assess them in a comparative way.

5 These planning regions (Raumordnungsregionen, RORs) have no administrative function; however, their boundaries follow the borders of the counties they include; thus, data can be obtained by aggregation of county data. Another advantage of using RORs is that functional linkages between a central city and its region can be included in the analysis (BBR 2002).

As figure 4 shows, Munich has the largest area although it is – regarding the population – comparable to Stuttgart, whilst Bremen has a significantly smaller population. Subsequently, also employment is much lower in Bremen compared to the other regions. Regarding economic structure, Stuttgart and Bremen share a relatively high percentage of employees in the industrial sector (close to the West German average and thus above the average of the metropolitan regions), while Munich shows a clear prevalence of employees in the service sector. Regarding the dynamics of the economic structure, Munich clearly is the most dynamic of the three regions. It is especially observable that the service sector in Munich has grown significantly, but also – similar to Stuttgart, industry employment declined during the 1990s. Bremen was much less dynamic in this respect. Neither has service employment been growing comparable to the West German average, nor was the decline of industry employment as serious as in the other regions.

Figure 4: Key characteristics of the examined regions

	Bremen	Munich	Stuttgart	*W- Germany*
Area 2000 [km²]	3.815	5.504	3.654	*248.449*
Population 2000 [1.000]*	1.070	2.426	2.605	*66.152*
Population density 2000 [Inhab./km²]	280	441	713	*266*
Population growth 1980-2000 [%]	5,5	6,3	10,3	*8,8*
Employees 2000 [1.000]*	532	1.482	1.403	*32.825*
Employed in industry professions 2000 [%]	27,6	17,4	29,0	*29,5*
Employed in service professions 2000 [%]	63,3	70,6	58,0	*60,7*
Industry employment dynamics 1990-2000 [%]	-12,6	-24,2	-23,9	*-17,0*
Service employment dynamics 1990-2000 [%]	6,9	18,0	7,4	*14,0*
Sect. concentration of ind. employment 2001**	0,11	0,09	0,13	*0,08*

Source: BBR 2002

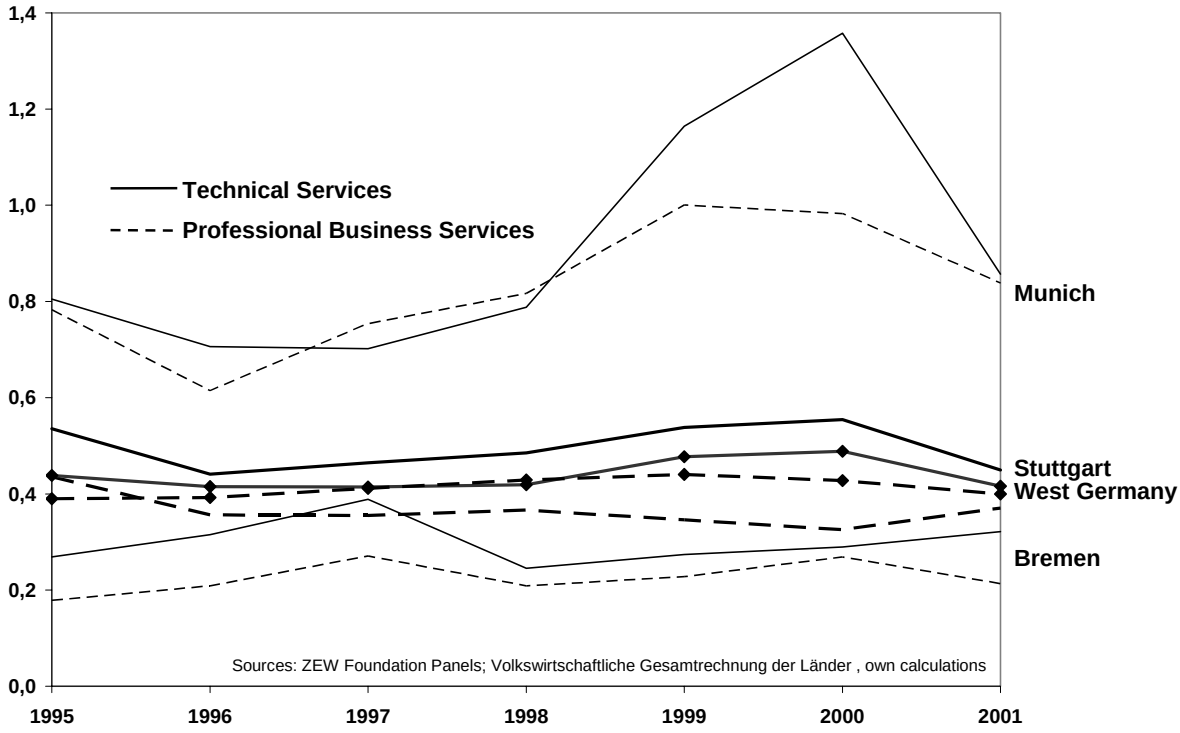
* Source: Statistisches Landesamt Baden-Württemberg 2003
** Herfindahl-Index, 2-digit WZ 93 (15-37). Source: IAB Beschäftigtenstatistik 2003, own calculations

Another important aspect is the structure and diversification of the industrial structure. Almus et al. (2001) discovered a correlation between sectoral concentration within the industrial sector and founding activities in the KIBS sector. Consequently, we may expect a greater dynamic in the KIBS sector with a more differentiated structure in the industrial sector. Regarding the Herfindahl-Index of the industrial sector, Stuttgart shows the highest concentration. This is certainly for historical reasons, as the region is strongly concentrated on the automotive, machinery and electrical engineering sector.

3.3 The foundation of KIBS in the examined regions

Figure 5 represents data of firm foundations in the KIBS-sector in the examined regions for the years 1996-2001. In order to make the data comparable we used the labour market approach (yearly foundations per 1,000 employees) (Fritsch/Niese 2003).

Figure 5: KIBS foundations per 1,000 employees 1995-2001



General observations from the graph are:

- There is a general prevalence of technical services. Exceptions are the periods 1997 and 1998 for West Germany and the Munich region.
- The prevalence of technical services is most significant (and constant) in Stuttgart (57.5% on average over the seven years), followed by Bremen (57.1%). In Munich, only 52.0% of the KIBS foundations were in the area of technical services (West Germany: 51.5%).
- Munich is the city with the highest rate of KIBS foundations; on average of the seven years there were more than twice as many foundations of KIBS per 1,000 employees than in the West German average; in Stuttgart, the foundation of technical services is above the average while the professional business services are outper-

formed by the West German average; Bremen has foundation rates constantly below average.[6]

- The foundation boom at the end of the 1990s becomes clearly visible in Munich and – although with less intensity – in West Germany; Bremen and Stuttgart show only slight increases of the foundation rates during the respective period.
- The extraordinary breaks in the curves in Bremen 1996-1998 and in Munich for technical services 1998-2000 might also be due to political initiatives stimulating firm foundations in the respective branches (a special EU programme to stimulate firm foundations in Bremen; the biotechnology initiative in Munich since 1998).

To resume, we can observe that the three regions exhibit different characteristics regarding the foundation of KIBS. While Munich shows an extraordinary dynamic, Bremen is below the West German average. Stuttgart shows above-average rates in technical services, but the region's foundation rates in professional business services are below the average. As the economic (industrial) structure in Stuttgart is more technically oriented, this might be a first indicator for the dependence of KIBS foundation rates on regional economic structure. In Munich, on the other hand, the relative weight of the professional business services might be connected to the strong service orientation of the overall economic structure.

In the following, we will analyse – using results of empirical research –the connections between the regional economic and institutional structure and the foundation of KIBS in the three regions.

4 Innovation system and KIBS in three German regions compared: case studies

4.1 Methodology

In order to examine the outlined questions, we conducted qualitative interviews with relevant actors in the respective regions (for this methodology see, for example, Healey/Rawlinson 1993 or Vaessen/Wever 1993). We chose interviewees from two groups: experts from the economic sector, science, and (regional) administration and founders of KIBS. Our principal aims were (1) to obtain deeper insights into the internal structure of the KIBS sector and its linkages and interdependencies with the (re-

6 Regarding firm foundations in all sectors, the situation is somewhat different: Munich also represents above-average foundation rates, but while Bremen has average rates, Stuttgart is below-average (Fritsch et al. 2001) However, it must be noted that Stuttgart also has the lowest firm failure rates in Germany.

gional) economy, and (2) to acquire a profound image of the region-specific circumstances.

The representation of the results of the interviews is supplemented by the results of an analysis of documents provided by the state and city administrations, by intermediate actors (like trade associations and the like, see bibliography), and the firms. We conducted a total of 43 interviews, which were distributed among groups of interviewees as follows:

Figure 6: Structure of interviews

	Bremen	Munich	Stuttgart	**Total**
KIBS founders	5	5	3	**13**
Experts	10	11	9	**30**
Total	**15**	**16**	**12**	**43**

In the form of case studies – based on our interviews as well as on insights from the existing literature – we will analyse the relevance and significance of the economic structure and specifics of the innovation systems for the foundation of KIBS start-ups.

4.2 Bremen

The economic structure of the Bremen region – with regard to the foundation of KIBS – can be characterised by its traditional manufacturing sector. A low degree of modernisation of the existing manufacturing enterprises (e.g. little in-house R&D activities, R&D staff, technology and innovation orientation) corresponds with few knowledge-based sectors and a small potential for business service outsourcing or a significant demand for knowledge-intensive services from external (new) firms. In addition, the few "big players" of Bremen‘s manufacturing sector are subsidiary plants with no or small R&D activities (e.g. steel industry, automobile industry[7], food production). No significant impulses from these enterprises with regard to start-up activities or a dynamic development in the KIBS sector were noted. The few firms able or having the human/technology potential to generate spin-off companies belong to the space and aviation sector, the mechanical engineering sector, the microelectronics sector and the port/logistics area.

Against the background of a more or less traditional/low-tech manufacturing sector, the local economic structure – with regard to renewing the regional innovation system by integrating KIBS start-up firms – appears to be restrictive. The private (profit-

7 The DaimlerChrysler production plant located in Bremen – as the biggest local employer – generates no or little significant demand for business services or outsourcing activities. As purely production-oriented, no R&D or technology-oriented activities relevant for demand of knowledge-intensive business services are carried out. In contrast, the relevance of the DaimlerChrysler headquarters in the Stuttgart region appears to be totally different for the KIBS.

oriented) knowledge infrastructure of the Bremen region can be characterised as being underdeveloped with below-average start-up intensity in the KIBS sector (see above). Very few start-up companies have the potential to grow into medium-sized structures with more than 50 employees (no "high-flyers"). This applies to firm-based start-ups as well as to science-based start-ups out of the University of Bremen or non-university research institutions. The overall situation with regard to start-up activities can be described as a process of catch-up development. Because the total number of firms as well as new firms within the sectors that are predestined for Bremen's technology-oriented development[8] is rather low, no "critical masses" for the realisation of external effects were noted.

Although cluster dynamics in the different KIBS branches are pretty hard to realise, the existing innovation and production networks are quite well established. The structure of the networks can be described as a loose collection of ties with open supplier and preliminary work connections. The entrepreneurs interviewed confirmed the positive effects of the open networks and value chains in the Bremen region. Quite obviously, geographical proximity – particularly to clients – within the early stage of development and the access to existing network structures in general seem to be crucial in order to compensate market and technology risks. In addition to the regional embedded innovation and production networks, different (political) initiatives were initiated to support start-up firms. These activities include advice, grants for students, graduates and scientific staff from the university, loans, setting up different working and discussion groups, entrepreneurial education etc. Although no explicit support measures for KIBS are implemented in Bremen, most of the start-ups are service-oriented and benefit from the public support once they fulfil the preconditions. As a public institution, the Bremer Innovation Agency (BIA) was founded to co-ordinate the different technology, innovation and entrepreneurship support programmes. With these competencies, the BIA takes over the function of a "one-stop-shop".

Within the process of a technology-oriented structural change, the Bremen region with its traditional manufacturing sector is catching up in development. Crucial to the modernisation of the region's production and innovation network will be the start-up intensity in technology- or knowledge-based branches. For obvious reasons, KIBS will play a major role in the years to come. Bremen's innovation policy of an endogenous regional development focuses on traditional strengths supplemented by new technologies. It is expected that this specific combination will put Bremen into a competitive position with other regions. Based on the qualitative empirical findings, it remains

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8 Those sectors include maritime biotechnology, logistics, environmental technology, health economy, aviation and space, information & communication technology, and design. As it is expected that the most dynamic processes will take place in these fields, different political initiatives to foster new technology and knowledge-based development have been initiated by the Senator of economic affairs and ports of Bremen.

hard to assess whether a path-dependent regional development will lead to a specialisation pattern with the possibility of a technological, economic and institutional lock-in or, on the contrary, to a diversification of the structure. There is no doubt that new enterprises will play a major part. Whether KIBS will be able to initiate radical innovations or a paradigmatic shift remains to be seen.

4.3 Munich

The authors of the Regional Entrepreneurship Monitor (REM, Bergmann et al. 2002) state that Munich is – in relation to entrepreneurial activities and preconditions for firm foundations – a top ranker in Germany.[9] This appraisal was also shared by most of the regional experts and entrepreneurs interviewed, who generally described Munich as a highly diversified and dynamic region with a powerful economic and scientific structure.[10] *"I don't know any technology essential for the future which is not present in Munich"*, was the statement of an interviewee asked about Munich's position with regard to its economic structure and dynamic. It has been emphasized that the Munich region has an important hub-function for its surrounding regions, as the quality and global orientation of Munich firms is outstanding. The Munich economy with its firms has a broad demand potential. This potential is a reason for the high dynamic in the KIBS sector. It has been frequently stated that the region provides fertile ground for the foundation of service firms.

On an intra-regional scale, the region shows a high differentiation with small-scale regional specialisations, often referred to as clusters. The most outstanding examples are the biotechnology cluster in Martinsried and the media cluster in Unterföhring (Landeshauptstadt München 2002). Other examples are the university-driven specialisation in agro food, brewery etc. in the region of Weihenstephan as well as the space technology in Garching. These clusters are the home of numerous KIBS. Inside the clusters, special qualifications and business ideas are the result of synergetic effects, of intense interaction between different actors. These facts combined build the base for a high endogenous potential for the foundation of KIBS.

As Figure 5 (see above) points out, in comparison to Bremen and Stuttgart (and as well to the West German average) a higher percentage of persons is working in service professions. This is due to:

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9 The REM is an empirical study examining ten German regions along various indicators regarding their preconditions for the existence and development of entrepreneurial activities.

10 However, the appearance of Munich changed a lot; it showed a highly dynamic development within the last few decades (for an appraisal of the historical development of the region, see Stenke 2002).

- The presence of several (German) headquarters of firms in the insurance (e.g. Allianz AG, Munich Re Group) and the IT sector (e.g. Microsoft GmbH, Oracle, Sun Microsystems) as well as important lawyers' offices, banks, and, last but not least, the powerful film and media sector.
- The presence of powerful industrial firms like Siemens, BMW, and the aviation & space technology sector (MTU, DASA). Many of those private firms carry out extended own R&D activities.
- The outstanding (public) research infrastructure: besides the two big universities (LMU and TU), Munich is the home of several academies und universities of applied sciences, the headquarters of the powerful German Max Planck and Fraunhofer Research Associations as well as other important research institutions (for an overview of the actual institutional and research (infra-)structure in Munich see Landeshauptstadt München 2002).
- Regarding public and private support of firm foundations, Munich is also well developed. General as well as sector-specific programmes are concerned with initiating and supporting firm foundation. Those activities are further based on one of the strongest German venture capital scenes.[11]
- Munich is the domicile of important intermediary institutions like the German and the European Patent Offices, among others.
- Last but not least, the high attractiveness of the region with regard to its tourist potential and its extremely good reputation might be another important factor.

Stenke (2002) characterised Munich as an innovative milieu. As many of our interviewees stated, it is not only the agglomeration and the close proximity of various private enterprises and public institutions constituting the Munich region which bring about its strength: particularly the *interaction* between those different actors, the coexistence of close internal co-operation and global hub function is at the very heart of the *"Munich Blend"*. Not only are those firms and institutions a fertile ground for upcoming entrepreneurs (generation of business ideas, experiences and qualifications); at the same time, they also constitute a high potential as customers for new firms.

4.4 Stuttgart

Stuttgart has the reputation of being quite a traditional location due to the fact that many long established "traditional" industrial firms, such as DaimlerChrysler or Bosch, are located in the Stuttgart region. This is certainly true, but, however, the concentration on traditional firms and sectors (like engineering, automobiles, and electrics) is only one part of the story. The Stuttgart region is also the home of important service

11 However, KIBS are not the main target group of these activities. Especially those KIBS which are not technology-based benefit rarely from these programmes. Thus, it is even more probable that the regional firm structure constitutes an important reason for those latter foundations.

and IT firms. It is the domicile of the German headquarters of IBM and Hewlett Packard. Certainly, the existing strong industrial base with its "traditional" firms was an important base for the development of the new sectors, but, nevertheless, the latest foundations do not totally depend upon those traditional sectors. However, the industry base is strong and the resident big players seem to have a fundamental influence on the region's economic performance.[12] This implies that the entry barriers for new firms are extremely high in some sectors.

Regarding the foundation of KIBS, a preponderance of technical services can be observed (see figure 4). This might be due to different factors:

- The regional universities and research institutions are mainly oriented towards technical and natural sciences; this might cause a qualification bias. Cumulative effects may be the consequence as entrepreneurs predominantly found new firms in their region of origin.
- The fact that many firm founders start their new firms out of a previous employment in another private business using their acquired competencies and knowledge might be a second explanatory fact for the dominance of technical KIBS in the region.
- It should also be noted that there is a somewhat symbiotic relationship between industry and science (universities etc.) strengthening the existing orientation towards technology-oriented firms.

It is not only the sectoral orientation of the KIBS foundation: some interviewees also mentioned that the traditionalism of the economy is reflected in the foundation of new firms. Stuttgart does not seem to be a good location for radical innovative foundations, there is a preponderance of classical service providers with a strong risk aversion. The interviewees were ambiguous about this fact: "*I see, on the one hand, foundations resulting from the tradition of the region (IT firms especially linked to mobility and electronics), and, on the other hand, but separated from the former, event managers, advertising agencies and the like; what is missing is the linking element between the two extremes; thus, the Stuttgart region seems somewhat fragmented.*"

In Stuttgart, the existing infrastructure for the support of firm foundations is extraordinarily strong and dense. Besides a strong traditional structure of industry chambers and specialised associations, various recently established institutions and programmes support and advise new firms. However, in addition to being characterised frequently as intransparent, this structure is strongly oriented to technical foundations. Technical KIBS are part of this group, but even these service firms are not in the focus of the

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12 DaimlerChrysler, for example, only establishes business connections with firms listed in the trade register. For new firms, this is a high entry barrier.

programmes. This part of the institutional setting seems rather to consolidate the existing structures.

The development of the region and the (sectoral) structure of start-ups further seem to be significantly influenced by the presence of the "local big players". These firms determine the demand potential, they are able to absorb labour force. However, as representatives of the "big players" informed us, there seems to be no systematic approach of the existing firms to foster entrepreneurship in the region. It seems to be more difficult to establish something new in the Stuttgart region. Frequently newly founded firms keep focusing on regional clients and thus impede openness to other segments. *"A lot of start-ups are innovative, but they are still strongly based on the traditional sectors, a really new mission is not being developed."*

4.5 Synthesis of results – analysis of the cases

Finally, the case studies are analysed by looking at their economic, technological and institutional preconditions for the foundation of KIBS (Figure 7). The interviewees in all regions confirmed that the pattern of firm foundations in the KIBS sector is closely interwoven to the regional economic, technological, and institutional set-up. This corresponds with the general line of hypothesis 1. Particularly, the manufacturing sector and global players within this sector seem to profoundly influence the pattern of start-ups in the KIBS sector. A strong economic as well as institutional influence – especially from embedded large companies – could influence the start-up dynamics, the specialisation pattern, and development of young companies. Insofar, a region can be a seedbed for firm foundations in the KIBS sector. However, not for any kind of KIBS: the incubator function seems to be especially plausible for KIBS corresponding to the region's sectoral and institutional setting. In detail, this question is worthy of being examined by further quantitative research.

Figure 7: Regional characteristics compared with regard to KIBS

	Bremen	**Munich**	**Stuttgart**
Techno-economic preconditions	dominance of traditional manufacturing firms and technologies; few knowledge-based sectors; segmented structure	strong manufacturing-service complex; global players & hubs; new industries; high-technology orientation in various sectors	dominance of mature technologies; three overlapping clusters: automobile, engineering, electronics; mixture of global players and SMEs
Newly founded KIBS	below average KIBS start-up intensity underdeveloped KIBS sector; few fast growing start-ups	above average KIBS start-up intensity cluster dynamics in various KIBS sectors; radical innovations; most important high-tech region in Germany	average KIBS start-up intensity; predominance of technical KIBS; strong orientation towards auto cluster; incremental innovations

	Bremen	Munich	Stuttgart
Origin of newly founded KIBS	few science-based KIBS foundations; primarily endogenous start-up projects	science-based high-potential KIBS foundations of importance; endogenous as well as projects from outside the region	primarily KIBS foundations out of regional economy; few science-based "radical" KIBS foundations
Institutional arrangement	limited amount of intermediary actors; few redundancies; clear competencies; "One-stop-shop" (Bremer Innovation Agency)	diversified institutional setting; institutional "thickness" with several intermediary actors and redundancies	institutional "thickness" with several redundancies; strong focus on "core" manufacturing sectors
Regulation, public support	political regulation and entrepreneurship support through one main institution; local industry with small absorptive capacity for KIBS output	strong political intervention: cluster support as well as technology programmes; auto, insurance and finance sector with great demand for KIBS output	strong influence of KIBS foundations through presence and density of large firms; numerous public support programmes
Innovation and production networks	well established existing network structure; loose collection of ties with open supplier and preliminary work connections	loose coupling in regional innovation system; openness to newly founded firms; global firms as "hubs" for start-ups	strong network integration; high entry barriers for newly founded KIBS into auto cluster; closed networks with danger of lock-in
Strengths	open network structure (optimal size of network?); recognition of the importance of new technologies and services for structural change; "One-Stop-Shop"	strong techno-economic sector with many innovation-oriented firms; high-technology orientation; global players; "image" and soft factors of the region	powerful regional economic system; many innovation-oriented firms; mixture of global players and SMEs; network integration as a risk- minimizing factor for start-ups?
Weaknesses	catch-up strategy with danger of imitating successful regions and technologies; poor economic performance of surrounding territories	high labour costs and rents for offices as problems for start-ups; big competition and market pressure as a result of strong existing and new firms	strong focus of start-ups to regional "lead clients" as an obstacle for global market access; dominance of mature branches (lock-in?)

Political and intermediary actors emphasized the importance of newly founded firms in general and KIBS in particular for the development of new technological fields. This awareness is reflected in a large number of regional and national political initiatives to foster entrepreneurial activities. In regard to the highly specialised technological and innovation segments (e.g. biotechnology, multimedia, information & communication technologies, nanotechnology, health services etc.) it can be observed that

firm foundations in these segments are strongly service-oriented. In all three regions KIBS foundations (as well as other service firms) have therefore a high share among new founded companies. This fact corresponds with a service-oriented structural change in various regions of the industrial world.

Although public funding in all three regions plays a certain role with regard to tapping the regional potential, the economic, institutional, and technological preconditions for the founding of KIBS remain different. Especially the structure and orientation of the regions‘ enterprise population (i.e. number of firms, size, sectoral distribution, technology-/innovation orientation, R&D intensity, regional vs. global market etc.) and network configurations within their respective innovation and production systems differ significantly. Stuttgart for example – compared to Bremen and Munich – is dominated by a few large global enterprises with strong linkages and networks in the region.

The combination of a strong economic sector with a few core technology fields and the institutional (political) influencing control with regard to regional framework conditions strongly affects the KIBS foundation pattern in various ways. If KIBS are not able to access existing production and innovation networks (entry barriers), they will suffer disadvantages concerning growth or success – notwithstanding the quality or innovativeness of their services. Whether this applies to all kinds of KIBS foundations cannot be answered with the present data. There is only a small chance that weakly embedded start-up firms emerge and develop positively. The importance of "proximity" within KIBS foundation processes has to be examined separately on a case-to-case base. In contrast to Stuttgart, the regions of Munich and Bremen are obviously characterised by lower entry barriers (i.e. open networks help new KIBS entrances), although Munich as "Germany’s No.1 high-technology region" (Sternberg/Tamasy 1999b) is known for its high competition and market pressure as a result of strong established as well as new firms.

Analysing the origin of the KIBS foundations in the three regions, differences can be noted: In contrast to a rather underdeveloped KIBS sector with only a few fast-growing firms in Bremen, the performance of new KIBS in Stuttgart and Munich seems to be better. Munich has a considerable number of science-based, fast growing radical innovators in the KIBS sector (e.g. bio- and nanotechnology, information & communication technologies) giving evidence of an innovation system that is open to new technologies diverging from already established technological paths. Even though Stuttgart has some successful science-based KIBS start-ups, the innovation system seems to favour incremental innovations. In fact, more "traditional" or "conservative" businesses – close to the existing technology paths of the automotive, engineering and electronics cluster – appear to be realised. Regarding hypothesis 2, we can state that in Stuttgart there is a rather high significance of spatial proximity in the existing economic structure (due to the "technology-bias"). This brings about a specialisation pattern in the KIBS sector reflecting this structure. Munich’s economy is characterised by

a high sectoral diversification which seems to favour a more accentuated outward orientation of the KIBS sector in general. In Bremen, the outcomes in this respect are rather inconsistent.

And, last but not least, how does the KIBS sector and its newly founded firms affect the regional economy and its development? Hypothesis 3 can only be accepted with some restrictions. Services with close connections to the regional manufacturing sector (like the firms in the Stuttgart region, but also those in Bremen) do not automatically contribute to positive regional cluster dynamics with subsequent cumulative effects. Nor do weakly embedded KIBS inevitably serve as a nucleus for a self-sustaining service cluster. The probability of such developments seems to be crucially dependent on the strength and the structure of the existing regional economy.

5 Concluding remarks and future perspectives

In this article the significance of economic structure and the innovation system for the foundation of new firms in the KIBS sector was examined. We did this by a comparison of three German metropolitan areas: the federal state capitals of Bremen, Munich, and Stuttgart. Our analysis has shown how existing firms, institutions and networks influence the development of the KIBS sector. A higher differentiation of the regional economy seems to lead to a more differentiated KIBS sector. To a certain degree, the structure of the KIBS sector reflects the existing regional economic structure, specialisation and dynamics.

This qualitative and explorative analysis has shown some of the mechanisms of interdependencies and interaction on the interface of KIBS, entrepreneurship and regional development. Based upon our study, it is possible to map out further questions for research in more detail, for example:

- Which types of KIBS rely most strongly on the *regional* economy and on the *regional* innovation system? Which are more independent and why?
- To what extent does the success of KIBS depend on the *integration* of the single start-up in regional economic and institutional networks?
- What are the most important *elements* of regional economic and institutional structure influencing the development of the firms?
- Does *functional integration* foster regional integration and under which circumstances?

These questions constitute a promising field for further examination both for entrepreneurship research as well as for research on the KIBS sector. And, moreover, by investigating several of the spatial and regional aspects worked out in our paper, some of

the current questions in contemporary economic geography – like the geography of knowledge and entrepreneurship - can be addressed.

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